REMARKS

In an Office Action dated April 10, 2009, the Examiner objected to the specification for failing to provide proper antecedent basis for matter recited in claim 33; and rejected claims 6-9, 23-26, and 28-43 under 35 U.S.C. §102(e) as anticipated by Friedland et al. (U.S. Patent 7,386,465).

Specification Objection

In response to the Examiner's objection to the Specification, applicants have amended claim 33 in accordance with the Examiner's suggestion.

Prior Art

Certain minor clarifying amendments have been made to selective independent claims. These amendments are meant to clarify, if such clarification be necessary, that "work items" are items of work performed by a computer system or similar (as opposed to general "work" performed by a person or machine), and that "additional computer resources" as recited in certain claims are something external to a computer system or set of systems to which the work is initially assigned.[1] Some independent claims are unamended. All claims are patentable over the cited art for the reasons stated herein.

As explained previously, applicants' invention relates to the scheduling of computer resources in an environment where at least some of the resources are fee-based. The exemplary embodiment involves a fee-based distributed computing system (grid system), in which computing resource can be purchased on demand. The fees for purchasing resource could vary by

[1] All independent claims except claim 23 include the limitation of "additional" computer resources. Claim 23 recites fee-based processing, and does not necessarily require "additional" computer resources.

time of day and/or day of week, or according to how busy the system is or other factors. In an exemplary embodiment, a local computer system or network, such as an in-house computer system within an enterprise, provides a limited amount of processing capability and is connected to the fee-based computing system for additional computing capacity. Other variations of this exemplary embodiment are possible.

In an environment such as an in-house computing system which is available to process tasks, it is possible to simply schedule the higher priority tasks on the available in-house resources, and defer all tasks which can't be scheduled on available in-house resources. However, in some circumstances this may cause relatively high priority work to be deferred, which could have real economic consequences to the enterprise. It is also possible to purchase additional computing resources necessary to meet demand in every case; however, this may cause the system to purchase unnecessarily expensive computing resources at peak demand times, when at least some of the tasks could have been deferred without adverse economic consequences.

Applicants recognize that, in these and other situations, conventional priority-based scheduling algorithms are generally unable to take proper account of the economic consequences of task deferral and properly schedule a variable amount of resource accordingly. Applicants therefore provide a system in which both resource allocation and the amount of work done are variable according to relative cost.

In accordance with applicants' system, a respective valuation is assigned to each of multiple data processing tasks ("work items", "programs", etc.) to be performed by a computer system or collection of computer systems, the valuation being specific to each task. This value is intended to represent some theoretical corresponding value associated with having the task done now as opposed to later. These values are compared to the cost of obtaining resources necessary to complete the task now, e.g., the fee charged for accessing an external computing grid to

perform the work. If the cost exceeds the value, the task is deferred; if not, the resource is obtained to perform the task now, and the resultant cost is incurred. In the exemplary embodiment, the highest valued tasks are assigned to the in-house system, and to the extent there are tasks left over, a determination is made whether to purchase external computing resources on a task-by-task basis, it being possible that all, some or none of the tasks will justify the purchase of additional computing resource. By deferring less "valuable" jobs, greater flexibility is achieved to process these jobs at a time when the fees are lower, or when in-house computing resources are idle so that no fee is required.

Therefore significant features of applicants' invention are that ***a respective valuation*** is associated with each of a plurality of tasks to be performed by a computer system ("work items", "programs", etc.), that this ***valuation is compared to a respective cost*** of the computing resources required to do the work, and that the scheduler ***selectively accesses the resources or defers processing*** based on this comparison. Applicants' representative claim 6, as amended, recites:

6. A computer-implemented method for managing access to computer resources, the method comprising:

(a) *defining a respective valuation of each of a plurality of work items* to be processed by one or more data processing systems;

(b) *comparing the respective valuation of each respective said work item to a respective cost of accessing additional computer resources* necessary to process the work item in a current time period, said additional computer resources being external to said one or more data processing systems;

(c) with respect to each said work item for which the *respective valuation of the work item exceeds the respective cost* of accessing additional computer resources necessary to process the work item in the current time period, *dynamically accessing additional computer resources necessary to process the work item in the current time period*;

(d) with respect to each said work item for which the *respective valuation of the work item does not exceed the respective cost* of accessing additional computer resources necessary to process the work item in the current time period, *deferring processing of the work item to a subsequent time period*; and

(e) repeating said (b) through (d) in one or more subsequent time periods with respect to each said work item deferred by said (d) until each said work item has been processed. [emphasis added]

The remaining independent claims vary in scope, but all contain limitations analogous to the italicized limitations above[2].

Friedland discloses a work scheduling system, which is preferably designed for use in a managed health care or mail order pharmacy application, although other applications may be possible. *Friedland* discloses a generalized algorithm for scheduling, given inputs of resources, tasks, constraints, and objectives. *Friedland* discloses that this is, in general, an open-ended problem in which excessive computing time can be devoted to finding an optimum solution. *Friedland* therefore employs a simplified algorithm. In accordance with *Friedland*'s algorithm, time is divided into discrete segments, and resources (people) are allocated to tasks in each time

[2] As noted, independent claim 23 does not recite "additional computer resources", but recites a method of providing fee-based processing, in which the valuation is compared with the projected fee for utilization of computer resources.

segment by generally allocating the most restrictive resources (the least capable people) first, consistent with any available constraints. Tasks may be assigned priorities, so that certain tasks will tend to be performed first.

Although *Friedland* discloses a generalized technique for scheduling work, and therefore associating work-performing resources with tasks to be performed, it does not disclose any of the specific key limitations of applicants' claims, as discussed above. In particular, *Friedland* does not disclose that a valuation is assigned to each task, that this valuation is compared to a cost of obtaining the resources necessary to perform the task (either as "additional resources" or resources in a fee based system), and that resources are allocated and tasks performed based on the results of the comparison.

As explained above, applicants' invention is designed to utilize a potentially variable resource pool, where that variability incurs a cost. The size of the potential resource pool may, for all practical purposes, be unlimited. I.e., it may be possible to assign respective dedicated processors from a large, fee-based computing grid to each of the tasks waiting to be performed, at inordinately high cost. The purpose is of applicants' invention is to balance the cost with the need to get tasks performed.

Friedland's scheduling algorithm, on the other hand, is directed at obtaining maximum efficiency from a fixed resource pool. *Friedland*'s algorithm is intended to be applied on a day-by-day basis (or possibly even an hour-by-hour basis) to assignment of resources in a defined environment, such as within a mail-order pharmacy. For this defined environment and for the defined period of time, there is no concept of "additional resource". ***There is simply a fixed pool of resources***, i.e., a pool of personnel, computer workstations, and so forth, which is available at that time and place. The purpose of *Friedland*'s algorithm is to maximize the efficiency of this fixed pool of resources, so that a maximum amount of work is performed within the applicable

time period. But, if it is impossible to perform all the incoming tasks in that time period, what does *Friedland* do? It simply defers the work to the next time period (next day, hour, or whatever).

Friedland does not associate a respective valuation with each task, as recited in applicants' claims. The passage cited by the Examiner says nothing more than that attributes may be assigned to different entities. This does not amount to a specific disclosure of the claim limitations. *Friedland* does disclose that a priority may be associated with each task, but that is not the same as a valuation. This priority is merely a representation of relative importance ***vis-a-vis other tasks***. It is not a quantity that can be compared in any meaningful manner to a cost of obtaining processing resources.

Friedland does not associate a cost with work-performing resources. *Friedland*'s resources are available, period. Of course, employees are paid, and to this extent there is some cost associated with each worker. But the worker is being paid the same amount, whether he works efficiently, inefficiently, or not at all.

Friedland does not perform a comparison of task valuation and cost of resources. *Friedland* uses the verb "compare", but discloses little else of relevance. Applicant recites two specific values being compared, and for a specific purpose. *Friedland* neither discloses these values nor that they are compared.

Friedland does not allocate resources based on the comparison of task valuation and resource cost. As explained above, *Friedland* does not make such a comparison. Furthermore, as explained above, *Friedland*'s resources are a fixed pool, and there is no disclosure in *Friedland* of allocating additional resources to the pool for any reason, and in particular, based on valuations of the tasks to be performed.

The Examiner appears to read *Friedland*'s "constraints" as satisfying these limitations. Applicants disagree. The constraints are just that, constraints on the assignment of resources. E.g., a resource (person) can't be assigned after the end of his shift, etc. These constraints at best define the scope of the resource. There is no disclosure in *Friedland* that (additional) resources can be allocated, contingent upon the value of the work item exceeding the cost of the resource.

For all of the above reasons, various essential claim limitations are not disclosed in *Friedland*, and the claims are not anticipated by *Friedland*.

Nor are the claims obvious over *Friedland*. *Friedland* is assuming a fixed amount of resource and attempting to maximize the use of that resource. Applicants' invention is directed to determining when to pay for a cost-based resource, the amount of resource to be paid for being variable. The two techniques are simply unrelated and orthogonal. It would, e.g., be possible to use a technique such as described in *Friedland* to maximize scheduling of in-house resources, and a technique as claimed by applicants to determine whether to purchase additional computing resources. But a technique such as claimed by applicants is not taught, suggested, or otherwise rendered obvious by *Friedland*'s disclosure.

Applicants' claims recite data processing tasks and data processing resources, and *Friedland* discloses resources primarily in the form of people who perform manual tasks. Applicants claims do not encompass the universe of scheduling tasks generally, but a narrowly directed to a particular environment, in which resources are readily available to be added, but at a cost. Friedland is not intended for this environment, and there is no indication in Friedland how it would deal with the availability of indefinite additional computing resource (e.g. from a computing grid) to perform data processing tasks. Although Friedland speaks in abstract terms about many possible input variables, there is no disclosure or suggestion of how it would address

applicants' particular environment, and we are left to speculate. Such a disclosure does not form the basis for a rejection for either anticipation or obviousness.

In view of the foregoing, applicants submit that the claims are now in condition for allowance and respectfully request reconsideration and allowance of all claims. In addition, the Examiner is encouraged to contact applicants' attorney by telephone if there are outstanding issues left to be resolved to place this case in condition for allowance.

Respectfully submitted,

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